

- 2) details of the proposed actions; and
- 3) experience from in-stream work in nearby Maplewood Creek;

an assessment of the proposed actions effects on the Madsen Creek ravine, the subject tributary basins, and the Cedar River has been developed. The following sections explain the effects anticipated to result from the proposed action. A determination of effect for each listed species is included in Section 8.0 of this report, along with a summary of rationale.

Potential impacts to coho salmon, a candidate for ESA-listing, are also summarized at the end of the impact section and a determination of jeopardy is made in the Determinations of Effects section in the event this species is listed prior to project completion.

7.1 Properly Functioning Conditions

Ideally, reliable scientific information would exist for all listed populations and all aquatic habitats in the action area that would allow the effects of an action to be quantified in terms of population impacts (NMFS, 1999). The NMFS listing of Puget Sound ESU chinook salmon is a relatively recent event (March 1999). Consequently, little quantitative information is currently known regarding the biological requirements for this listed fish species in Puget Sound basins. As stated in the recent August 29, 1999 supplement to the NMFS guidance document, *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS, 1996), in the absence of population-specific information, an assessment must define the biological requirements of a listed fish species in terms of properly functioning conditions (PFC). Properly Functioning Conditions are the sustained presence of natural habitat-forming processes necessary for the long-term survival of the species through the full range of environmental variation (NMFS, 1999). Indicators of PFC vary between different landscapes based on unique physiographic and geologic features. Since aquatic habitats are inherently dynamic, PFC is defined by the persistence of natural processes that maintain habitat productivity at a level sufficient to ensure long-term survival (NMFS, 1999).

Tables A-1 and A-2 in Appendix A describe *baseline conditions* of PFC indicators in the action area relevant to the long-term survival of chinook salmon and bull trout. Table A-3 summarizes potential *temporary changes* to PFC in the action area due to construction, all of which are contemporaneous to construction (direct effects). Table A-4 summarizes potential *long-term changes* to PFC in the action area due to the proposed modifications. Most of these long-term changes will take some time to occur and are therefore considered indirect effects.

Changes to these PFC that constitute a potential risk or benefit to listed or candidate species, either from construction or from permanent modification, are discussed in detail below:

7.2 Indirect Effects Expected to Occur in the Action Area Due to Proposed Modifications

7.2.1 Streamflow/Peak Flow

As noted in previous sections, full accommodation of increased flows resulting from development since 1974 would require approximately 100 acre-feet of storm flow control detention. Currently, the basin contains approximately 35 acre-feet of storage. The proposed project would increase flow control storage by approximately 14 acre feet to 49 percent of the optimum detention. These figures do not include additional water quality detention. Increased detention would be accomplished through the creation of a Northwest Tributary pond (4 acre-feet).

The proposed additional detention would decrease overall peak flows on Madsen Creek by approximately 10 percent. Peak flows on the West Tributary would be reduced to pre-development levels since all developed area storm flow from this subbasin would be diverted to the detention facility. Peak flows to the Northwest Tributary would be controlled to the pre-1974 development level (approximately) as well.

Additional opportunities for flow control through detention within the entire Madsen Creek basin were evaluated; however, no additional cost-effective or significantly-sized detention opportunities were identified. The analysis did note that approximately 150 acres in the Lake Youngs drainage basin, which is adjacent to the Madsen Creek basin to the south, contributes runoff flows to Madsen Creek. Evaluation of the potential for removal of that flow component is not part of this project.

7.2.2 Sediment and Erosion Control

The proposed project would substantially reduce the potential for erosion and sediment production in the Madsen Creek basin through a number of mechanisms: reduction of peak flows and concomitant hydraulic energies; stabilization of existing erosional areas through stream habitat enhancement activities (placement of LWD/boulders/gravels); energy dissipation at several hydraulic-impact locations, specifically LWD/boulder structures at tributary confluence points; and removal of the potential for erosion related to overflows from the East Fork wetland.

Based on King County maintenance records for the period from 1985 to 2000, a total of 22,963 cubic yards of sediment was removed from the Madsen Creek sediment pond. Annual volumes varied from a low of 260 cubic yards in 2000 to a maximum of 6,386 cubic yards in 1990. The mean annual volume of sediment removed over these 16 years is 1,435 cubic yards. The upland portions of the Madsen Creek basin yield very little sediment, and therefore virtually all of the sediment captured in the sediment pond is derived from erosion within the Madsen Creek ravine (King County Department of Natural Resources, 2000).

The size of particles retained in the sediment pond varies over time, depending on the surface area of water in the pond and the discharge flowing through it. Based on qualitative examination

of these sediments trapped in the pond though, it appears that they consist largely of sand and gravel-sized particles (King County Department of Natural Resources, 2000a).

Based on the character of the deposits that underlie the Madsen Creek ravine, it is estimated that fine (silt and clay-sized) particles constitute one-quarter of the total volume of eroded sediment. Inspection of sediment trapped in the pond suggests that most of this fine sediment is not deposited in the sediment pond but carried as suspended material (turbidity) through the pond into the channel downstream. It is also likely that most of this fine sediment that passes through the pond is carried downstream all the way to the Cedar River. This is especially true during large flow events, when the majority of sediment is in motion, and when the high-flow bypass is in operation (King County Department of Natural Resources, 2000a).

This analysis suggests that, on a mean annual basis, Madsen Creek currently discharges a volume of fine sediment to the Cedar River equal to one third of the volume removed from the detention pond, or approximately 500 cubic yards per year (King County Department of Natural Resources, 2000).

In other words, one quarter of the gravel, sand, and fines that is delivered to the pond is fines, which is then transported to downstream sections. The volume of this one quarter is 33 percent of the volume of sand and gravel remaining in the sediment pond, or approximately 500 cubic yards per year.

The proposed projects are intended to address the most significant sources of sediment in the Madsen Creek ravine. It is reasonable to expect that the proposed project may reduce erosion and total sediment discharge from this basin by one half. If this level of performance is achieved, then the mean annual discharge of fine sediment to the Cedar River would also be reduced by half, a reduction of 250 cubic yards per year (King County Department of Natural Resources, 2000).

This evaluation includes a number of poorly constrained assumptions. It does, however, provide a reasonable, if imprecise, estimate of the anticipated reduction in fine sediment discharge as a result of this project. Monitoring of the downstream sediment pond during annual maintenance will provide information of the effectiveness of these measures.

If permit conditions prohibit future maintenance of the sediment pond and overflow channel, sediment will collect in these facilities, eventually to capacity. Once these facilities are full, sediment from the middle and upper reaches of the system will likely travel to downstream slack-water areas. As these areas fill in the lower channel, sediment will likely pass through to the Cedar River, posing a threat to chinook spawning areas near the confluence of Madsen Creek. It is not known, however, how long it would take for the lower Madsen Creek channels to fill, or what fraction of this annual load would be delivered to the Cedar River once the lower channel is full.

Due to the large quantity of material removed from the sediment pond, reduction of the sediment load on the pond is of particular importance to chinook spawning in the Cedar River, particularly if the likelihood of future pond-excavation permitting is in question. The primary focus of the proposed action is to reduce sediment mobilization from the main erosion sites in the upper

drainage of Madsen Creek. It is estimated, therefore, that the main indirect effect of the project on the Cedar River would be a reduction in the transfer of fines from the Madsen Creek ravine. This indirect effect is expected to be beneficial for chinook salmon reproductive success in the Cedar River, particularly for reproduction that occurs near and below the confluence of Madsen Creek.

7.2.3 Water Quality

All elements of the proposed project will positively impact water quality once the adjustment period is complete and the stream channels have reached a more stable equilibrium. Reductions in peak flows through flow control will reduce sediment loads and turbidity. In addition, the new Northwest Tributary detention pond will have water quality elements. Flow discharges will be constructed to remove floating petroleum product accumulations. These structures will also permit access for hazardous chemical spill control. Vegetation will help to reduce metals, nutrients, and sediment loads.

The bypass conduits proposed as part of the project will have positive secondary impacts on water quality. Both conduits are designed to remove peak flows in excess of the existing channel capacities and thereby prevent erosion and sediment entrainment.

Habitat enhancement elements, particularly creation of pools and stabilization of eroded banks, will improve water quality in a number of ways. Increased streamside vegetation will reduce sediment and will also reduce summer temperatures by improving stream shading. In-stream habitat improvement will stabilize stream channels and reduce erosion.

7.2.4 Fish Habitat

All elements of the proposed project are expected to provide significant salmonid fish habitat benefits. Decreased peak flows will reduce erosion and the potential for mass wasting events that can destroy spawning and rearing habitat downstream. The bypass conduits will have the effect of removing flows in excess of stream capacity from sensitive stream reaches. Improvements in water quality will improve spawning and rearing conditions for sensitive species.

The habitat enhancement elements will have positive but variable impacts on threatened, endangered, and sensitive species. As noted in the *Madsen Creek Adult Fish Survey Technical Memorandum* (Adolfson Associates, Inc., February 2000), the lower reaches of Madsen Creek may support populations of coho and sockeye salmon, as well as sea-run cutthroat trout. The downstream end of the lower reach (near the mouth) may also potentially support chinook and chum salmon, although no chinook or chum salmon have been identified in the Madsen Creek system (Adolfson, 2000). Because of past degradation, the potential extent of basin occupancy of each of these species is not known, but the effect of the improvements will be to extend potential habitat occupancy for sensitive species. In particular, cutthroat trout may be able to reoccupy large portions of the mainstem Madsen Creek as well as portions of the Northwest Tributary and East Fork. Proposed monitoring (two or three times over a 5-year period) for habitat structure stability can also be used to evaluate natural re-population progress for each species.

7.2.5 Wetlands

Wetland values will be improved by the proposed project. The creation of the Northwest Tributary pond will create additional wetland and pond fringe areas, particularly in relation to the additional six acres of created detention. In addition, the habitat enhancement elements will stabilize large portions of the forested, scrub-shrub emergent wetland along Madsen Creek and its tributary channels. The currently unstable conditions with their high potential for slope failures and creation of deeply incised ravines tends to reduce this wetland area as well as its functional values. Amphibious species are expected to be particularly sensitive to this degradation and would be positively impacted by the creation of stable habitat. The stabilization of flows (to near base flow levels) on the West Tributary may have positive effects for the same reasons, although it is possible the streamside wetland area may be diminished slightly by the routing of upland flows to the Northwest Tributary pond.

7.2.6 Wildlife Habitat, Avian Species

The benefits to wildlife habitat will not be as extensive as for fish; however, all project aspects will have generally positive impacts on woodland species. Reduction of erosion and revegetation of sensitive banks and ravines will tend to improve the habitat for most species. In particular, improved water quality and improved channel structure will tend to increase habitat for vertebrate and invertebrate prey species (especially amphibians), allowing for greater wildlife populations. The construction of the Northwest Tributary pond will create additional wetland acreage in the basin, which will improve habitat for wetland-dependent wildlife, as well as forage habitat for predator species. Eagles, however, are not likely to be affected as the closest known nest site is on Mercer Island, more than four miles away.

7.3 Direct Effects to the Action Area due to Construction

Although Best Management Practices (BMPs), Temporary Erosion Control Plans (TESCP), Spill Prevention Plans, and other Conservation Measures will be utilized and tailored to the specific features of the site, virtually every PFC indicator will likely be temporarily degraded in the middle reach of Madsen Creek and in the tributaries during construction.

Overall, the proposed modifications will be installed with a minimal amount of impact to the riparian corridor. Conservation measures detailed above for water quality preservation (i.e., hand installation of structures and the use of helicopters and skylines) will also protect riparian vegetation from track and tire damage, large-scale clearing/grubbing, and access roadway construction.

The following section analyzes potential impacts that could result from the proposed construction and from general disturbance of the stream channel. Each identified potential impact is followed by a discussion of the measures that will be taken to minimize the potential impact. A summary of these conservation measures is then provided in the following section.

7.3.1 Fish Species

Because chinook and bull trout use of Madsen Creek above the sediment pond is discountable, the possibility of direct impacts from the proposed action affecting chinook salmon or bull trout is discountable, except with respect to water quality and sediment impacts downstream. Chinook juvenile use of the lower reach of Madsen Creek, however, can not be discounted.

Sedimentation of pool habitat, degradation of water quality, and reductions in benthic invertebrate or fish prey species from the ravine section of Madsen Creek could negatively affect these individuals. These potential impacts are discussed below.

7.3.1.1 *Sediment*

Areas below the sediment pond are unlikely to be affected by sediment from the in-water work areas as the pond collects unsuspended sediments from flow in Madsen Creek. Suspended and colloidal particles released into Madsen Creek during in-water work will likely pass through the sediment pond and move downstream to the Cedar River as turbidity where dilution will reduce the concentration of these particles. Monitoring in the Cedar River will ensure that Washington State water quality standards are met (less than 5 NTU above background levels). Effects of marginal turbidity (less than five NTU) on spawning gravels is expected to be negligible (WAC 173-201A).

The only in-water work that will not occur above the sediment pond is the cleaning of the sediment pond itself. Although this activity already occurs annually, the proposed actions will likely contribute additional sediments to the pond, which will likely result in additional cleaning activity. Disturbed sediments in the pond may not have ample time to fall out of the water column prior to discharge into the low-flow channel unless the pond is taken completely off-line during the cleaning process.

Specific Conservation Measures for Prevention of Sedimentation Downstream. A 12-inch CMP bypass line already lies in place for use during pond sediment removal. The opening to the line lies approximately 50 feet above the entrance to the sediment pond, and the outlet delivers flow to the low-flow channel. Sandbag dams will be used to divert surface flow in Madsen Creek into the bypass line. A 3-foot deep hole will also be dug in the streambed and a sump-pump will be placed in the bottom to divert subsurface flow into the bypass line.

No in-water work will be done during sediment pond cleaning, and turbidity in Madsen Creek at the entrance to the sediment pond will be monitored prior to cleaning. Cleaning will be postponed until turbidity levels above the pond are no greater than 5 NTU above baseline levels upstream of the work areas (details of the monitoring plan are included in Appendix D).

7.3.1.2 *Turbidity*

It is possible that chinook in the lower reach of Madsen Creek near the confluence with the Cedar River will be present during occasional construction-related turbidity events. These events, however, are anticipated to be relatively short and only follow periods of in-water work.

Effects of the turbidity on any rearing juveniles present near the mouth of Madsen Creek are expected to be negligible.

Specific Conservation Measures for Prevention of Turbidity in the Cedar River. Turbidity events caused by work in Madsen Creek are not anticipated to result in noticeable turbidity increases in the Cedar River (greater than 5 NTU above levels measured at Elliot Bridge upstream: see the monitoring plan in Appendix D). Even though it is unlikely that turbidity below the sediment pond would be associated with unsuspended sediments, which could cause damage to spawning gravels in the Cedar River, turbidity will be monitored in the Cedar River above and below the Madsen Creek confluence. Response procedures for turbidity threshold exceedance are detailed in the Summary of Conservation Measures section.

7.3.1.3 Water Quality

Although not expected, spills of toxic fluids may occur during construction, as the project will require the use of some heavy machinery. Water temperatures may also temporarily increase due to bank clearing in the work areas.

Specific Conservation Measures for Preservation of Water Quality in Madsen Creek. No heavy equipment will be used directly in the ravine. Installations in the ravine will be done by hand and materials delivered by helicopter and skyline, or by crane from the edge of the ravine. Uncontrollable spills directly into or near moving water are therefore not anticipated. Clean-up procedures for accidental spills are discussed in the Conservation Measures section.

With regard to temperature changes, high temperatures do not appear to be a limiting factor in the Cedar River system. Nonetheless, little clearing will be necessary, as work will be done by hand and materials delivered by helicopter or skyline.

7.3.1.4 Reductions in Prey Availability

Activity in the stream channel of Madsen Creek will disturb the substrate and likely displace benthic invertebrates and resident fish. These disturbances could result in a more variable supply of prey downstream in the lower channel of Madsen Creek.

Relevant Limiting Factors and Specific Conservation Measures. Prey abundance does not appear to be a limiting factor in the Cedar River or Madsen Creek. Nonetheless, dewatering will be used as a technique to limit sedimentation of substrates above the sediment pond as necessary. Water quality monitoring in the mainstem above the sediment pond will be used to determine when dewatering or other BMPs are necessary for erosion control. Thresholds, monitoring methods, and reaction protocols are detailed in Appendix D.

7.3.2 Avian Species

Helicopters will be used during the construction period to move equipment and materials from the staging areas to the work areas (Figure 2). Eagles have been found to be sensitive to both

noise and human activity within specific distances of their nests (Stalmaster, 1987; Watson, 1994). Recommended buffer zones around nest sites range from 600 to 800 feet (Watson and Cunningham, 1994). Less is known about eagle tolerance of human activity near feeding or perching sites, but the WDFW recommends a buffer of 1,500 feet between feeding areas and both human activity and permanent structures. In perching areas, where little screening is present, buffers of 800 to 1,000 feet are recommended (Stalmaster, 1987).

Bald eagles may forage along the Cedar River when adult salmon or salmon carcasses are present. The highest level of foraging activity is expected during the fall and winter. Regardless, some foraging activity may occur within the project area during the construction window for this project since eagles are not precluded from the project area and the bald eagle has an extensive prey base.

Factors that Limit the Potential for Disturbance of Bald Eagle. No eagle foraging habitat will likely be impacted by the project, as no active nests are known within 4 miles of the project area (WDFW, 2000). Eagles forage in the Cedar River, although eagle foraging activity in Washington State, for the most part, occurs in the winter when construction will not be underway. No adverse effects are anticipated, therefore, due to the distance of the project area from known eagle activity, existing tree screening between known perches and the project area, and timing of the project.

Other birds in the project vicinity are likely to be affected to differing degrees by the noise and human activity associated with the project. Most of the species that currently utilize this habitat are acclimated to a wide range of human activities. Individual birds, however, may be temporarily displaced by the project activities. The overall effect of a potential displacement of potential eagle avian prey species is discountable.

7.3.3 Interrelated and Interdependent Effects

The Fairwood plateau is almost completely developed into residential, commercial, and golf course land uses. No additional development is awaiting the completion of the proposed detention pond or the proposed tributary stabilization projects. The potential for additional excavation activity in the sediment pond is discussed in the Direct Effects section (7.2.1) above.

The Madsen Creek Erosion Stabilization Project is not interdependent with or interrelated to other projects in the drainage related to Fairwood community sewer services.

7.4 Cumulative Effects

The NMFS and USFWS (1998) identify cumulative effects as effects reasonably certain to occur, and not involving a federal action (that would be evaluated through a separate section 7 review). Although this study did not include a comprehensive study of land use in the action area, it is likely that other efforts to improve fish habitat conditions in the Cedar River drainage will occur in the near future. Although this proposed action might not substantially change the overall condition of spawning and rearing habitat in the drainage, it is possible that a basin-wide effort toward erosion and peak-flow stabilization may reverse the current decline of some Cedar River salmon species.

7.5 Beneficial Effects

The USFWS and NMFS (1998) identify “beneficial effects” as actions which “are contemporaneous positive effects without any adverse effects.” Positive effects previously discussed are therefore not technically considered “beneficial effects” as they occur later in time.

7.6 Effects of the Proposed Action on Candidate Species

Puget Sound/Straight of Georgia ESU coho salmon are candidates for ESA listing. Although coho salmon are not protected by the ESA, a summary of the effects of the action on the species is included here in case the ESU is listed prior to project completion:

Long-term effects of the proposed actions will likely benefit coho salmon more than chinook salmon and bull trout since coho salmon access and utilize the sections of the Madsen Creek drainage where habitat improvements will be made. For the same reason, short-term impacts will likely be more direct to coho than to chinook salmon and bull trout as they are more likely to be present in work areas during construction. Conservation measures planned for the project that limit direct and indirect impacts to coho salmon are summarized in the following section.

8.0 SUMMARY OF RECOMMENDED CONSERVATION MEASURES

The main objective of the mitigation strategy is to insure that soils disturbed in the ravine during construction do not cause harm to chinook spawning habitat in the Cedar River. As is discussed above, chinook spawning is known to occur in the Cedar River and sediments from erosion sites in the Madsen Creek ravine likely contribute, at least in part, to sedimentation of Cedar River spawning gravels near the confluence of Madsen Creek.

As the objective of the project is to reduce chronic sedimentation and improve habitat, the success of the project would effectively mitigate construction-related impacts, even if no conservation measures were employed in the project. However, because of the threatened nature of the Puget Sound chinook ESU, all practicable measures will be taken to prevent construction impacts from occurring.

8.1 Mitigating Factors

Before mitigation strategies were developed for this project, downstream sections of Madsen Creek were analyzed to identify natural sediment-retaining features. Two were identified: 1) the sediment pond, and 2) the low-gradient channel between the sediment pond and the Cedar River (approximately one mile long).

When empty, the sediment pond is capable of holding approximately 200 cubic yards of material from the middle and upper reaches of Madsen Creek (Krank, personal communication, 2000). The pond is also equipped with a bypass culvert for use during clean-out operations. Once placed on-line, this bypass directs flow from upstream directly to the low-flow channel

(bypassing the sediment pond), insulating the lower reach from sediment disturbances in the pond. The lower reach of Madsen Creek provides additional sediment capacity if needed.

8.2 Turbidity in Madsen Creek

Analysis of similar actions in nearby basins indicates that turbidity produced by the project above five NTU would likely be limited to Madsen Creek (King County Department of Natural Resources, 2000a). Of all the listed fish species in the Lake Washington Basin, only chinook salmon are likely to use Madsen Creek. And of all the various chinook life stages that likely exist in the Cedar River Basin, only rearing juveniles are likely to utilize lower Madsen Creek (due to habitat limitations).

It is possible that chinook in the lower reach of Madsen Creek near the confluence with the Cedar River will be present during occasional construction-related turbidity events. These events, however, are anticipated to be relatively short and only follow periods of in-water work. Since no chinook spawning likely occurs in Madsen Creek (or, at least, no successful spawning), the chance that sediment could escape the sediment pond and deposit in the lower channel does not pose a threat to chinook spawning habitat in the Cedar River Basin.

8.3 Turbidity in the Cedar River

Elevated turbidity in the Cedar River, however, would be of concern (above five NTU) if accompanied by denser sediments, as chinook-spawning habitat does exist below Madsen Creek (King County, 2000a). Dilution of Madsen Creek flows in the Cedar River however, will likely prevent turbidity events above five NTU in spawning areas. Sediment mobilized during construction is not likely to escape the sediment pond, and even less likely to escape the lower channel of Madsen Creek. Nonetheless, WTD would implement a water quality monitoring plan to minimize, monitor, and manage erosion in work areas during construction (refer to Appendix D). The primary purpose of the plan would be to ensure that chinook-spawning areas in the Cedar River are not affected by project construction.

Measures in the project plan that reduce potential sedimentation from the source include:

- 1) limiting in-water work and construction to the dry season (June 1 to September 30);
- 2) using low-impact methods (hand labor, helicopters, and skylines) that minimize soil disturbance and unexpected construction-related impacts; and
- 3) customizing best management plans (BMP) for the work-area to reduce soil exposure.

If turbidity below the confluence of Madsen Creek exceeds baseline levels by more than five Nephelometric Turbidity Units (NTU), in-stream work will be suspended until the sediment source is located and managed. Work will also be suspended if stream flow in Madsen Creek exceeds five cubic feet per second (cfs) above the sediment pond.

8.4 Reducing Erosion Hazards at the Source

The following is a list of recommended conservation measures mainly intended to minimize sedimentation (some previously discussed per impact in the Effects Section):

- 1) No heavy machinery will be used in the tributaries or mainstem ravines. Placement of all rock and LWD material within the ravines will be performed using a skyline, helicopter, or machinery from the top edge of slope. Heavy machinery is planned for use only for the placement of pipelines and along the upper segment of the Northwest ravine where a rough roadway exists at the top of slope. Where heavy machinery cannot reach without disturbing the ravine environment, skyline or helicopter placement will be used. To minimize noise and risks involved with the use of helicopters, skylines will be used as much as possible.
- 2) A sediment pond at the base of the ravine will be able to provide backup collection of sediment that is not controlled immediately. Best Management Practices will be used at each construction site to reduce the amount of erosion. These will include the placement of mulch, silt barriers, stopping work during significant storms, and covering of erodible stockpiles.
- 3) Construction in the ravines will occur during low-flow periods (below five cfs as measured directly above the sediment pond).
- 4) To avoid potential direct and indirect effects, all permit agencies, the contractor, and the county will designate a primary and secondary contact representative. Project goals, methods, schedule, and target milestones will be discussed during a pre-construction meeting attended by all representatives. All coordination will occur through these individuals. The designated representatives will be responsible for distributing pertinent project information to other parties within their organizations. To help avoid unanticipated direct impacts and to minimize identified direct impacts during construction, a qualified fisheries/wildlife biologist will attend the pre-construction meeting to advise the County regarding site specific conservation measures and explain the specific conservation measures associated with dewatering.
- 5) All uncontrolled sources of sediment entering the stream will be immediately stabilized. Damaged or insufficient erosion control devices will be repaired, replaced, or augmented immediately. A qualified fisheries/wildlife biologist will be on-site during all in-water work to insure the proper installation and maintenance of erosion and sedimentation control structures and measures.
- 6) To minimize direct effects prior to dewatering, biologists shall attempt to remove as many fish as possible from wetted work areas. Removal methods such as the use of seine nets or kick nets are recommended. A biologist shall remain on-site during the dewatering operations to move stranded fish not collected prior to dewatering to unaffected stream habitats above the work area. A clean new bucket filled with fresh stream water and an aquarium net will be available on-site at all times during dewatering to temporarily hold and transport fish. Collection methods will not include the use of electrofishing unless specifically directed by NMFS.

- 7) To minimize the potential for accidents resulting in direct effects to listed and candidate fish, construction equipment will be fitted with emergency spill kits and construction crews will be trained in their proper use. No heavy equipment will be directly used in the ravine.
- 8) To minimize the potential for direct impacts to listed and candidate fish, the county will require that no hazardous materials or toxic materials be transferred or stored within 100 feet of the ordinary high water mark of Madsen Creek, its tributaries, or adjacent to any stormwater retention, detention, or drainage facility.
- 9) To minimize the potential for direct impacts to listed and candidate fish, the county will require that no equipment is refueled or maintained within 100 feet of the ordinary high water mark of a stream. Equipment will be serviced or maintained in designated areas where stormwater runoff can be prevented from directly entering streams.

8.5 Monitoring

Monitoring will occur in the Cedar River and in the mainstem of Madsen Creek above the sediment pond before construction (to establish a general baseline), during construction (to monitor increases against the baseline), and after construction (to monitor the long-term effects of the modifications).

Performance Standards:

- 1) Work will be suspended until the site of erosion is stabilized if turbidity exceeds five NTU above the baseline in the Cedar River.
- 2) The bypass will not be used to direct water away from the sediment pond until turbidity falls below 5 NTU below the work areas (as measured above baseline conditions in the mainstem above work areas). The County installed a water quality and flow monitoring station in January 2000 just upstream of the sediment pond. This station will be used to monitor turbidity below the work areas.

Protocol for monitoring before and during construction, in the mainstem of Madsen Creek and in the Cedar River is outlined in Appendix D.

8.6 Maintenance

Water quality, stream structure, vegetation, and fish usage will be monitored for a minimum period of five years after project completion to evaluate and adjust the enhancement work. Installed stream structures that do not remain in place or have an adverse impact on the stream's habitat will be adjusted.

9.0 DETERMINATIONS OF EFFECT

Provided that the construction techniques and conservation measures summarized herein and discussed in detail in the construction drawings prepared for the project are properly

implemented, this project is anticipated to have the following effects on ESA-regulated species and candidate species:

9.1 Threatened Species

9.1.1 Puget Sound ESU Chinook Salmon

The Madsen Creek Tributary Stabilization Project “**may affect**,” but is “**not likely to adversely affect**” Puget Sound ESU chinook salmon.

A “may affect” determination is warranted based on the following rationale:

- 1) Reductions in sediment mobilization from the Madsen Creek ravine will likely reduce sedimentation in the Cedar River.
- 2) The Cedar River system has one of the strongest wild chinook populations in the Lake Washington watershed. Five redds were documented within two miles downstream of Madsen Creek in 1999, and small numbers of rearing chinook may use the lower sections of Madsen Creek near the confluence during warm months.
- 3) The proposed actions include the temporary modification of in-stream features which could produce turbidity events in Madsen Creek.

A “may affect, not likely to adversely affect” determination is warranted for this proposed action for chinook because:

- 1) Chinook are not expected to occur within the project area during construction. For this reason, the potential to directly harm chinook in the project area is expected to be discountable.
- 2) Downstream effects of construction are expected to be limited to turbidity events in Madsen Creek, which does not contain habitat suitable for chinook spawning⁴.
- 3) Turbidity events are expected to be short in duration and only follow in-water work activity in the project area. Effects of turbidity on any rearing juvenile chinook in lower Madsen Creek are expected to be negligible.
- 4) The only anticipated effect of the project on the Cedar River is an improvement of chinook habitat conditions.⁵

⁴ No chinook spawning has been documented in Madsen Creek.

⁵ Sediment from the work areas dense enough to settle into Cedar River chinook redds is expected to settle in the sediment pond where it will be removed. Turbidity events in Madsen Creek are expected to be diluted enough that spawning habitat in the Cedar River will not be affected. Nonetheless, the project has been scheduled to avoid work during periods of chinook spawning and egg incubation.

9.1.2 Puget Sound Coastal Bull Trout

It is expected that the proposed action **“may affect,”** but is **“not likely to adversely affect”** coastal bull trout.

A “may affect” determination is warranted based on the following rationale:

- 1) Although reproducing populations of bull trout in the Lake Washington Basin are limited to drainages in the upper Cedar River watershed, straying adult bull trout from other basins are not entirely precluded from Madsen Creek.

A determination “may affect, not likely to adversely affect” determination is warranted for this proposed action for bull trout because:

- 1) The potential for bull trout presence within the direct effects action area is expected to be discountable. No bull trout spawning or rearing is known or thought to occur within Madsen Creek, the Cedar River, or Lake Washington below the project area due to lack of proper habitat features.
- 2) The overall effect of the project is anticipated to be an improvement of aquatic habitat conditions in the Cedar River where bull trout presence is not discountable (within the Indirect Effects Action Area).

9.1.3 Bald Eagle

This project **“may affect,”** but is **“not likely to adversely affect”** bald eagles. A “may affect” determination is warranted based on the following rationale:

- 1) Bald eagle are not precluded from the action area.
- 2) Helicopters will be used in the action area during the work period. Eagles are known to be sensitive to noise and disturbance within 1,500 feet of their nests.
- 3) Eagles prey on fish species, which may be affected by the proposed actions.

A “may affect, not likely to adversely affect” determination is warranted for bald eagles for the proposed actions because:

- 1) No nests or roosts are known within two miles of the project boundaries. No impacts to bald eagle nesting activity, related to helicopter noise or otherwise, are anticipated as a result of this project. No potential nesting, roosting, perching or foraging habitat will be negatively impacted by the project.
- 2) Timing of the project will be after the nesting period of bald eagle.
- 3) Transient eagles that might enter the work areas during construction will likely avoid the area. This will not likely adversely affect eagles as no foraging areas or flight paths are known to occur in the work areas.

- 4) Impacts to the eagles piscine prey base are expected to be beneficial in the long-run.

9.2 Proposed Critical Habitat for Puget Sound ESU Chinook Salmon

The project **will not result in “adverse modification”** to proposed Critical Habitat.

This determination is warranted based on the following rationale:

- 1) It is not anticipated that the proposed action will result in sediment deposition in the Cedar River. Conservation measures in the project plans are designed to prevent the escape of sediment beyond the sediment pond and turbidity will be monitored in the Cedar River.
- 2) Work within the stream channel will ultimately improve water quality and prey abundance downstream.
- 3) Sediment deposition in the Cedar River will likely be reduced in the long-term as a result of the project.

9.3 Candidate Species

9.3.1 Coho Salmon

Coho salmon are currently a candidate fish stock. No protection for candidate stocks is afforded under the ESA, and section 7 consultation or conference with NMFS is not required for anticipated impacts to these species. Summary information for this candidate species is included herein in the event these candidate species become listed or proposed prior to project completion.

This assessment has identified that the project has the potential to impact coho salmon; however, the anticipated effect is not expected to result in significant degradation of coho habitat in Madsen Creek. Should coho salmon become proposed for listing or listed under the ESA prior to completion of the project, the action agency will confer with NMFS to determine if additional coordination or consultation is warranted. In the event that coho become listed prior to project completion, it is expected that further consultation would result in a **“may affect, and is likely to adversely affect”** determination for coho salmon.

A “may affect” determination would be warranted based on the following rationale:

- 1) Multiple sources document coho usage in Madsen Creek, including some observations above the sediment pond.
- 2) Madsen Creek is known to contain habitat suitable for spawning and rearing coho salmon.
- 3) The proposed action will include the modification of in-water habitats as discussed above.

A “may affect, and is likely to adversely affect” determination would be warranted for coho for the proposed actions because:

- 1) Although the project has been scheduled to avoid work during periods of coho spawning, egg incubation, and the peak outmigration of chinook juveniles, coho regularly rear in fresh water for up to three years. Therefore, it is expected that juvenile coho will be present in the action area during in-water work.
- 2) Although the level of use of coho juveniles within the work areas during the in-water work is expected to be low, it is not expected to be discountable.

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